

(No Model.)

3 Sheets—Sheet 1.

J. E. ROWE.

THREAD CHANGER FOR KNITTING MACHINES.

No. 606,029.

Patented June 21, 1898.

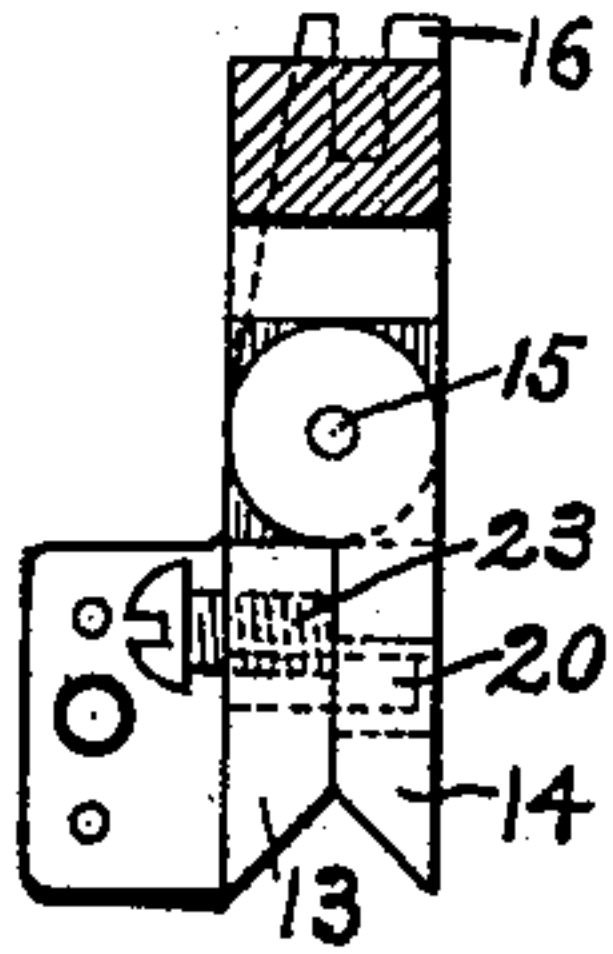


Fig. 11.

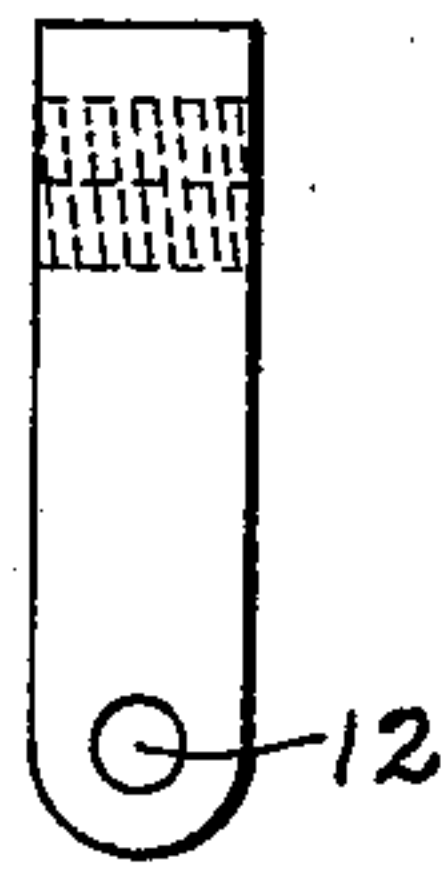


Fig. 12.

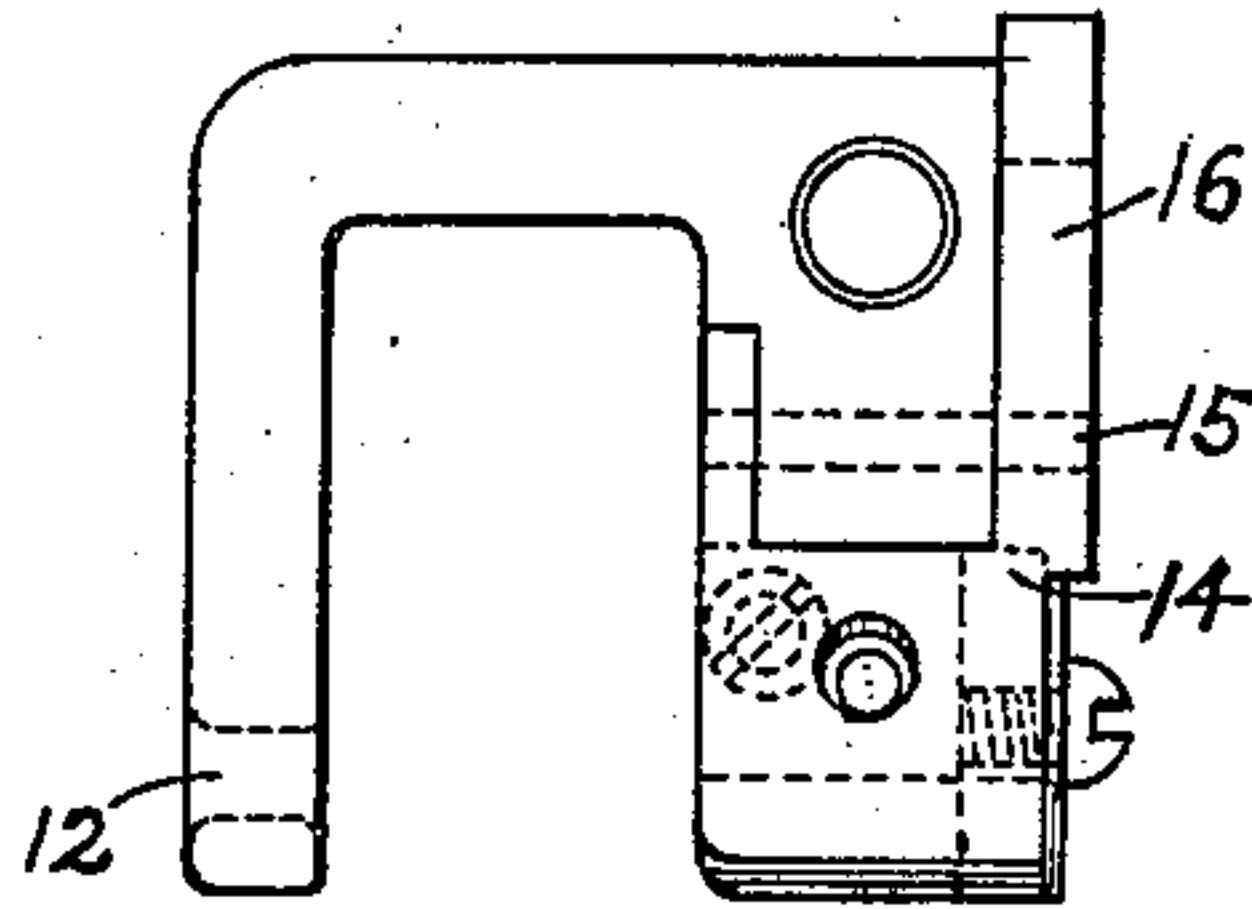


Fig. 9.

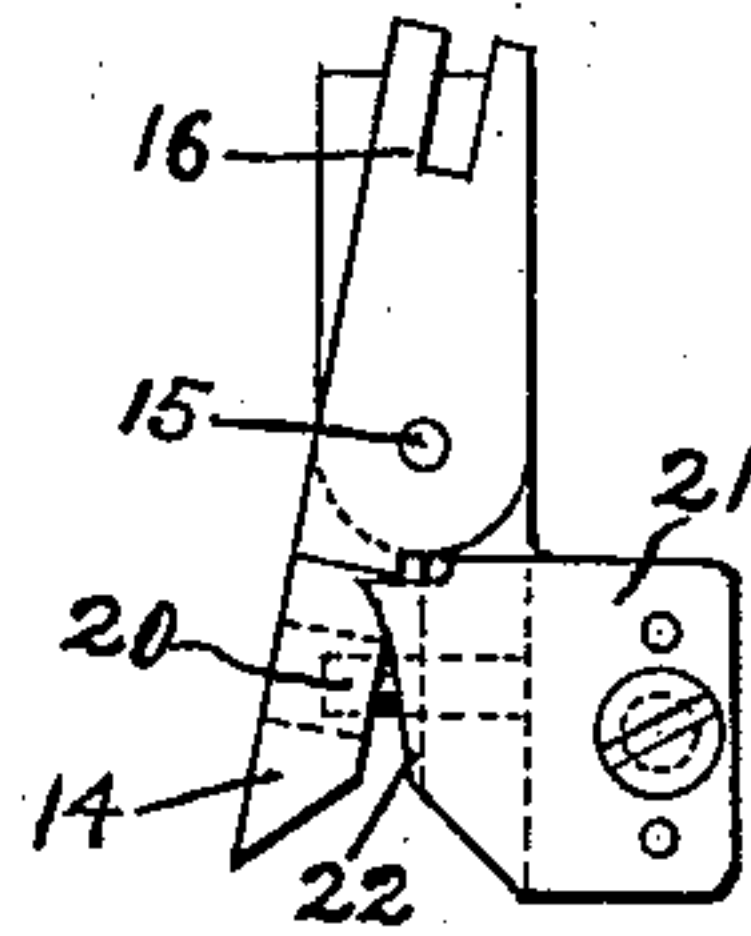


Fig. 10.

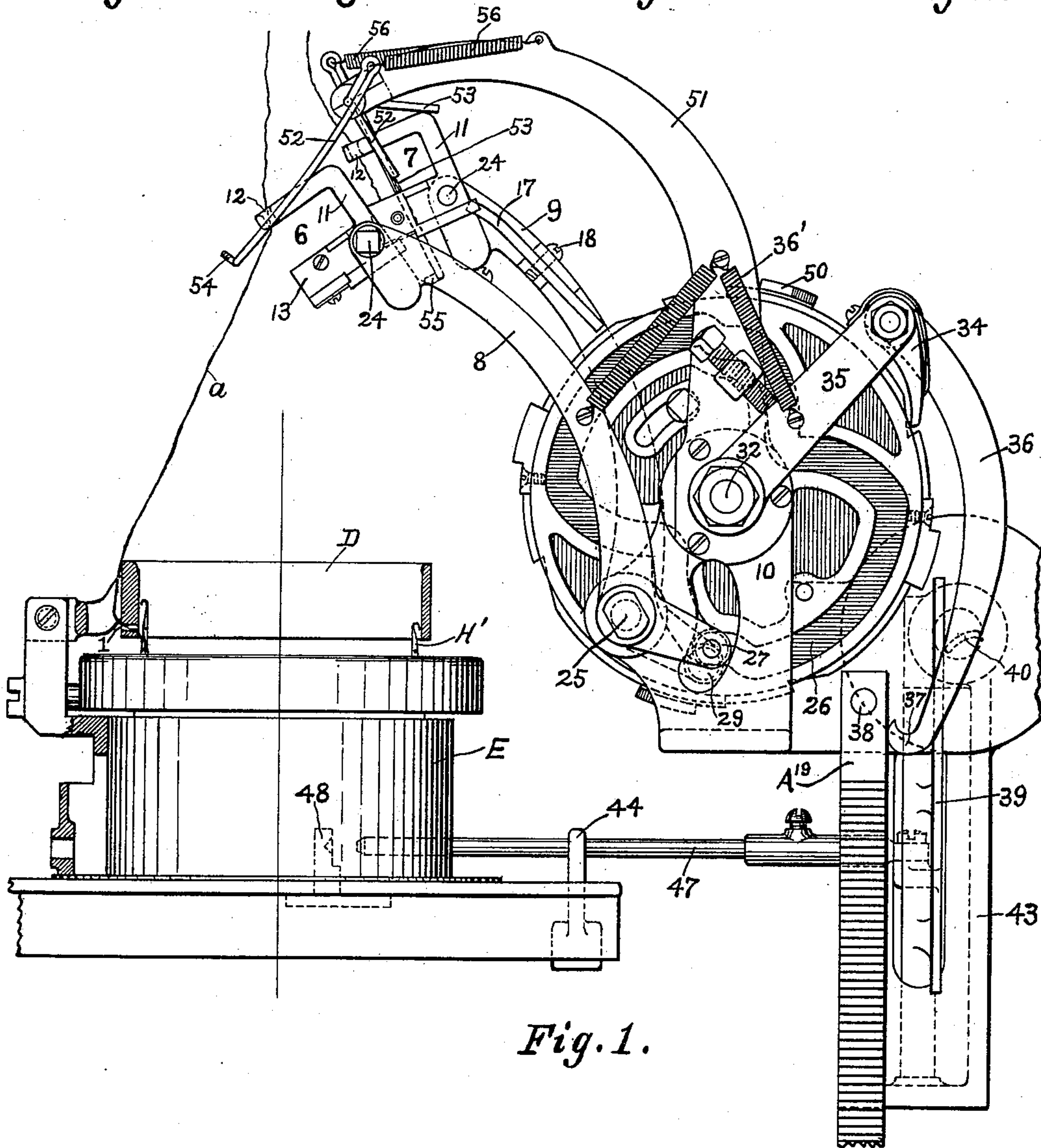


Fig. 1.

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(No Model.)

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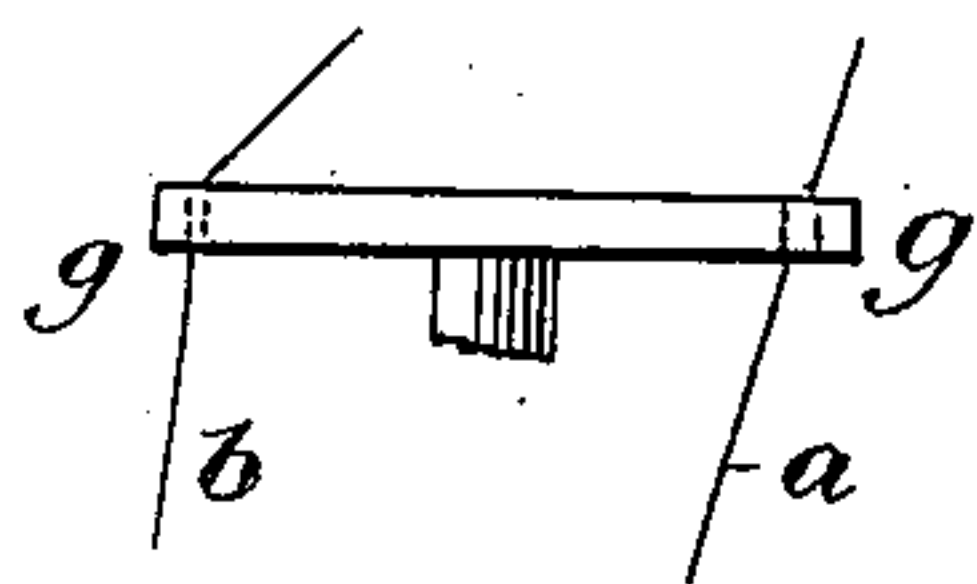


Fig. 8.

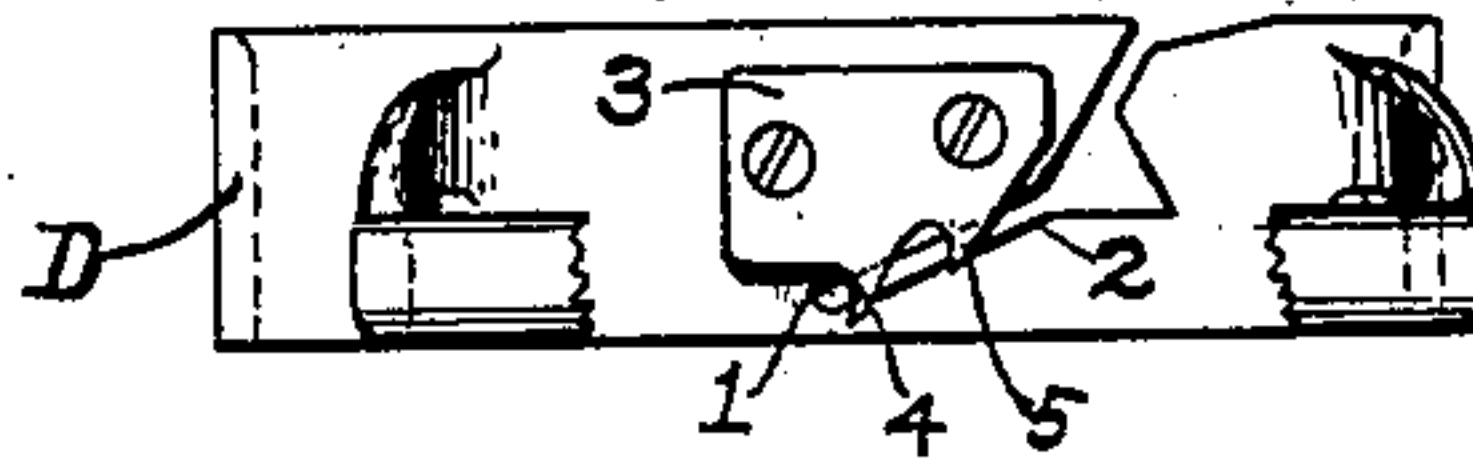


Fig. 7.

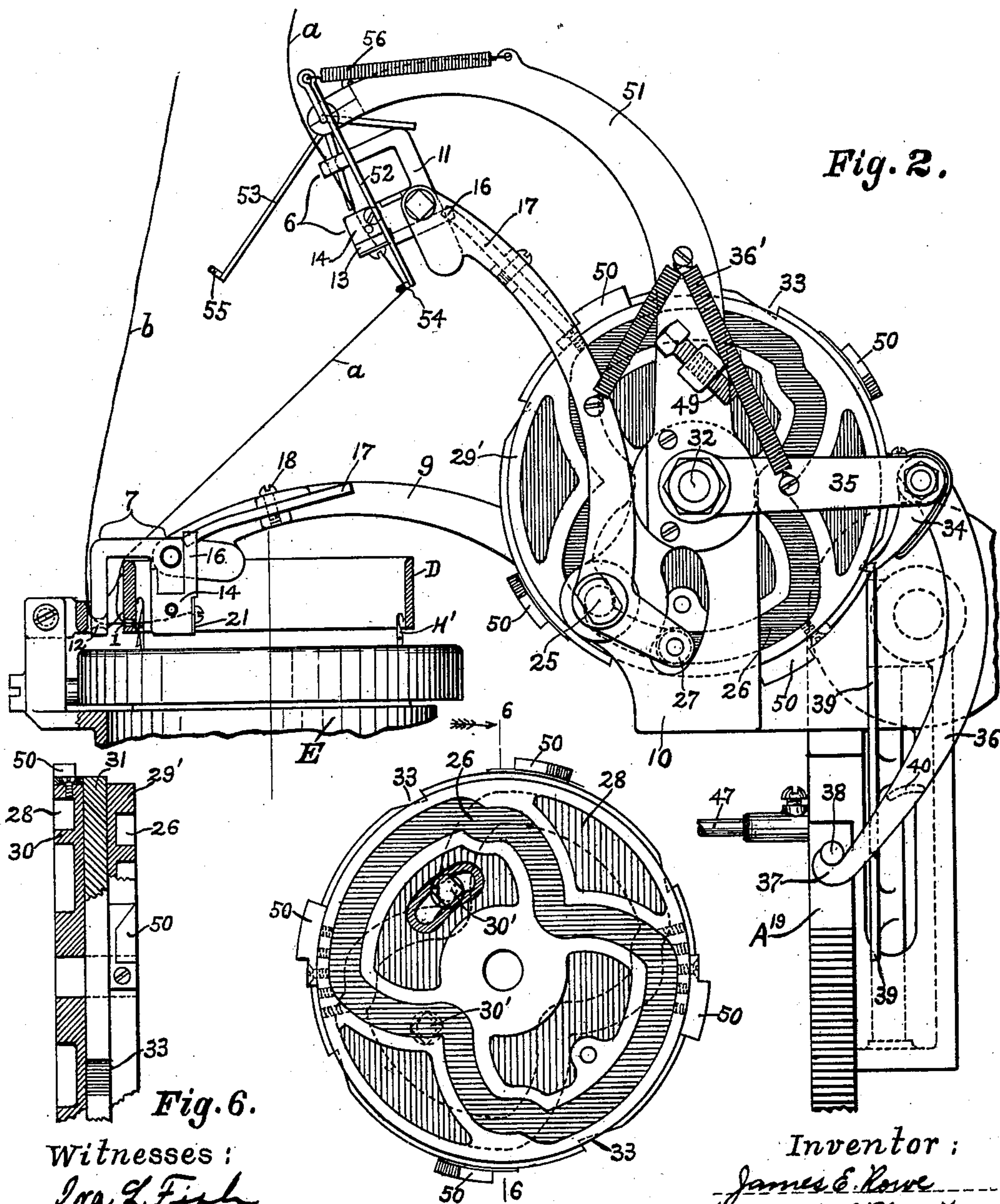


Fig. 2.

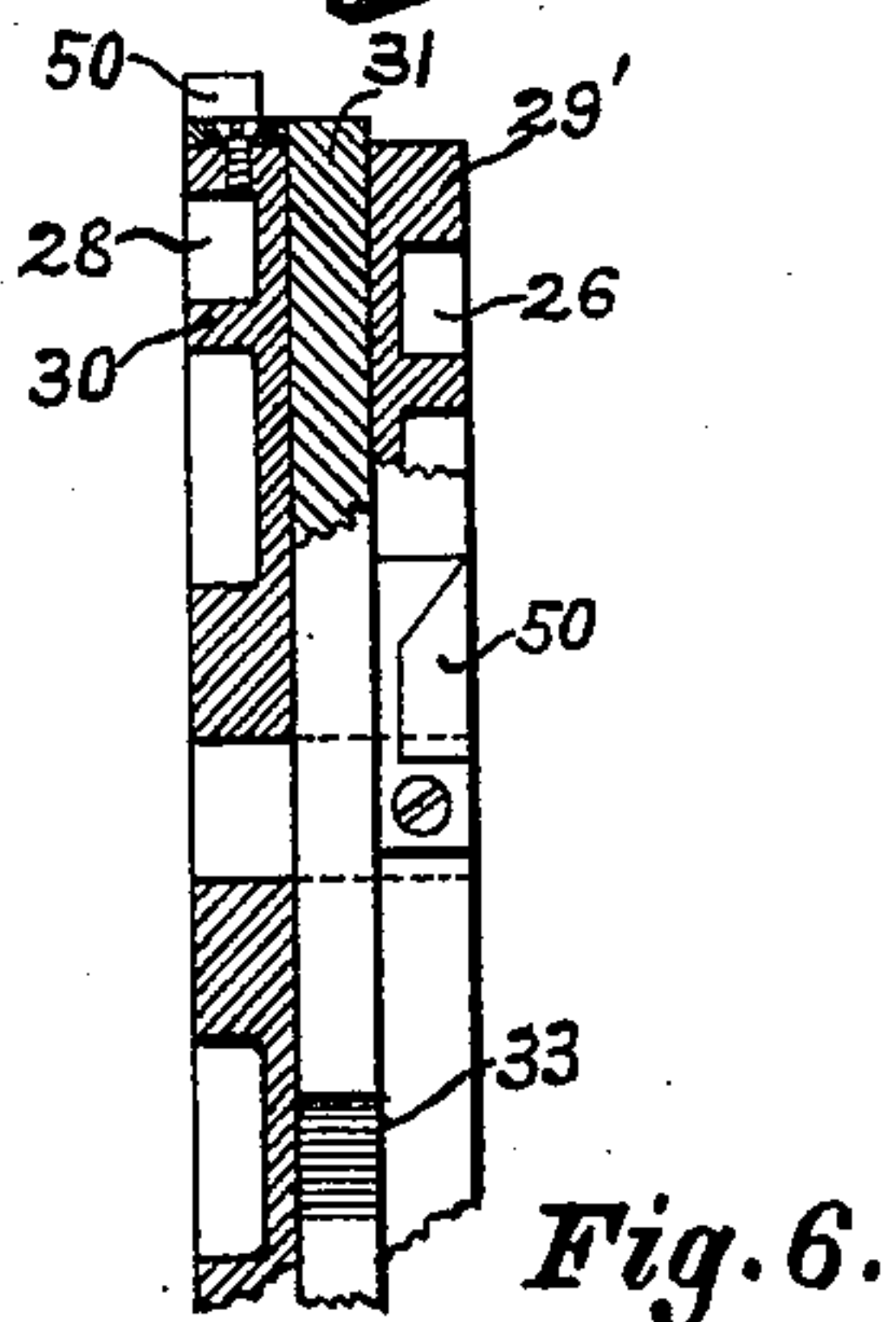


Fig. 6.

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Fig. 5.

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3 Sheets—Sheet 3.

THREAD CHANGER FOR KNITTING MACHINES.

Patented June 21, 1898.



Fig. 4.

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UNITED STATES PATENT OFFICE.

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THREAD-CHANGER FOR KNITTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 606,029, dated June 21, 1898.

Application filed August 9, 1897. Serial No. 647,581. (No model.)

To all whom it may concern:

Be it known that I, JAMES E. ROWE, of Pawtucket, county of Providence, and State of Rhode Island, have invented certain new and useful Improvements in Thread-Changers for Knitting-Machines; and I do hereby declare the following specification, taken in connection with the accompanying drawings, forming a part of the same, to be a full, clear, and exact description thereof.

In knitting stockings or other forms of knitted fabric it is frequently desirable to use yarns or threads of different color or quality in different parts of the article produced, and in order that this may be accomplished economically and without loss of time the change from one kind of yarn to another should be done automatically and without interfering with the continuous operation of the machine.

The present invention relates to an attachment for thus changing the yarn which may be applied to the various forms of knitting-machines now in use, is simple in construction, and will accurately and positively change the yarn without interfering with the speed or operation of the machine.

With the present invention the thread-bobbins may be mounted upon supports, which are not carried with the traveling cam-carrier, and said carrier may be run at a higher rate of speed than is practical in those machines in which one or all of the thread-bobbins are carried with the cam-carrier, due to the fact that the moving parts carry less weight. In the mechanism embodying the invention in its preferred form the threads are successively carried to the needles and to the main thread-guide which travels with the cam-carrier by a plurality of thread-carriers, there being a carrier for each thread. The carriers in this embodiment of the invention are duplicates of each other, and each consists of a thread-eye and a thread-holder. The knitting-thread passes through one thread-eye to the main thread-guide and needles, while the other thread is held by the gripper of the other carrier, which at this time is back out of active position. When the thread is to be changed, the carrier which is back out of active position moves toward the needles and carries

its thread to the main thread-guide and to the needles and then moves into its active position—that is to say, into the position which it occupies while its thread is passing to the needles. At the same time the other carrier moves back out of its active position and its thread is carried into its holder and severed, the loose end being knit into the fabric and the other end being held by the holder until the carrier is moved to the needles. With this preferred construction of carrier while the carriers are in their active position the thread-eyes form guides for the threads, and when the carriers are moved the thread-eyes form thread-engaging devices, which cooperate with the thread-holders to carry the threads to the needles. Carriers may be used, however, in which the thread-engaging devices do not act as guides, in which case the threads may pass through ordinary guides, which are permanently attached to the stationary frame, or other forms of carriers may be used.

Referring to the drawings, Figure 1 is a side elevation showing a mechanism embodying the various features of the present improvements in their preferred form, together with so much of a rotary knitting-machine as is necessary to illustrate the application of said mechanism thereto. Fig. 2 is a similar view showing the parts in another position. Fig. 3 is a plan view. Fig. 4 is a detail view of the operating mechanism. Fig. 5 is a detail view of the cam-disk. Fig. 6 is a sectional elevation view on line 6 6, Fig. 5. Figs. 7 and 8 are detail views of the latch-guard, showing the main thread-guide. Figs. 9, 10, 11, and 12 are detail views of the grippers and thread-eyes for guiding and carrying the threads to the needles.

In the accompanying drawings the thread-changing mechanism is shown applied to the knitting-machine shown and described in Letters Patent No. 570,059, granted October 27, 1896, and the mechanism is so timed that the thread will be changed at the heel and toe of the stockings; but it will be understood that the mechanism may be readily applied to other forms of knitting-machines and that the mechanism may be timed to change the thread at any part of the fabric being knit.

The knitting-head is provided with the ordinary needle-cylinder, in which the needles II' are guided. The needles are operated by the usual cams carried by the rotary cam-cylinder E, which is operated by the mechanism shown in the patent referred to. The latch-guard D is pivoted to a standard rising from the cam-cylinder E and has formed therein the main thread-guide 1. A passage 2 leads from the top of the latch-guard to the thread-guide 1, and the threads are carried to the guide 1 through this passage. A plate 3 is secured to the latch-guard and is provided with a finger 4, which overlies the passage 2 and prevents the escape of the thread from the guide. The plate 3 is also provided with a second finger 5, which also overlies the passage 2 and acts as a safety-stop to prevent the thread from pulling out of the passage in case the carrier moves back before said thread has entered the guide 1. The threads are successively carried to the needles and to the thread-guide 1 by two carriers 6 and 7, secured to the ends of two carrier-arms 8 and 9, pivoted to a support 10. Each of these carriers consists of a U-shaped piece 11, having a thread-eye 12 in one of its arms, the other arm forming the stationary jaw 13 of a gripper for holding the thread. The movable jaw 14 of the gripper is pivoted at 15 to the stationary jaw and is provided with a rearwardly-extending arm 16, engaged by the end of a lever 17, pivoted at 18 to the arm supporting the carrier. Springs 19 act upon the levers 17 and serve to hold the jaws of the grippers closed. A pin 20 extends from the jaw 13 into a recess in the jaw 14 and serves to limit the entrance of the thread between the jaws. A plate 21 is secured to the jaw 13 and is provided with a knife-edge 22, which coacts with the edge of jaw 14 to sever the thread when the jaws are closed. A screw 23 serves as an adjustable stop for limiting the approach of the jaws to each other, and thus adjusting the grip upon the thread, so that said thread will pull from between the jaws without danger of breaking. The pieces 11 are secured to the ends of the carrier-arms by means of bolts 24.

The arm 8 is pivoted to the support 10 at 25 and is rocked upon its pivot at the proper time by means of a cam-groove 26, engaged by roll 27 on the end of arm 8. A similar cam-groove 28, Fig. 4, acts upon a roll 29 on the arm 9 and rocks said arm at the proper time. The cam-grooves 26 and 28 are formed in disks 29' and 30, adjustably secured by means of bolts 30' to a disk 31, mounted on a shaft or stud 32 in the support 10. The support 10 is secured to a bracket 43 by a stud 56, which extends through a boss on said bracket and is provided with a nut 57 upon its outer end. The disk 31 is provided with a series of notches 33, which are engaged by a spring-pawl 34, mounted on an arm 35, pivoted on the stud 32. The arm 35 may be rocked at the proper time by any suitable

mechanism, and in the form shown is rocked as the machine passes onto and off of the heel and toe by the following mechanism:

An arm 36 is pivoted to the pawl-arm 35 and is provided with a shoulder 37.

A¹⁹ is the reciprocating rack for oscillating the cam-cylinder during the formation of the heel and toe and is provided with a pin 38, which forms a projection on said rack for engaging the shoulder 37 and drawing down the arms 36 and 35, which are returned by spring 36'. The shoulder 37 is held out of the path of the projection 38 by means of a plate or guard 39, which engages a projection 40 on said arm. The plate 39 is carried by a lever 41, pivoted at 42 to a bracket 43, secured to the frame of the machine. A rod 47 is pivoted to the rear end of the lever 41 and passes through a slot in one arm of a bell-crank lever 44. The other arm of the bell-crank lever is in the path of a series of lugs 45 on the pattern-chain 46, which is fed forward by a pawl and ratchet, as described in the patent referred to. A spring 46' serves to keep the rod 47 against the rear end of the slot in the lever 44 and to hold the lever 41 in its normal position. The lever 41, which is rocked at the beginning and completion of the heel and toe, as described in the above patent, is provided with a stud 48, having a conical recess adapted to engage the conical end of the rod 47. The end of rod 47 is normally in the position shown in Fig. 3 out of the path of stud 48. Just before the lever 41 is rocked by the cam C⁹ one of the lugs 45 passes under the end of lever 44 and rocks said lever, thus moving the end of rod 47 into the path of the stud 48. Now when the lever 41 is operated the stud 48 acts on rod 47 and rocks the lever 41, thus moving the guard, and allows the arm 36 to swing forward to bring the shoulder 37 into the path of pin 38. On the downward stroke of the rack A¹⁹ the pin 38 engages the shoulder 37 and draws down the arms 36 and 35, and thus moves the disks 29', 30, and 31 a step forward. When the rack A¹⁹ starts upward, the spring 46' acts to return the lever 41 to its normal position and the guard 39 engages the projection 40 on arm 36 and moves the shoulder 37 out of engagement with the pin 38, when the spring 36' returns the arm 35 to its normal position, the bolt 49 serving as a stop to limit its upward movement.

The disks 29' and 30 carry a series of cams 50 for acting on the ends of levers 17 to open the jaws of the thread-holders, and two arms 51 extend upward from the support 10 and support two bell-crank levers 52 and 53, which are provided with lateral arms 54 and 55 for engaging the threads and carrying them between the jaws of the grippers. Springs 56 tend to hold the arms 54 and 55 in their forward position.

Supposing the parts to be in the position shown in Fig. 1, the operation is as follows: The thread *a*, which at this time is the knitting-thread, passes from the usual fixed guides

g through the thread-eye 12 in carrier 6 and through the main thread-guide 1 to the needles. At this time the carrier is in what may be termed its "active" position—that is to say, in such a position that its thread-eye 12 will be substantially in line with the axis of the cam-cylinder and in position to properly guide the knitting-thread to the main thread-guide. The arm 54 lies in front of the thread a. The thread b passes from the usual fixed guide g through the eye 12 of the carrier 7, and the end of said thread is held between the jaws 13 and 14 of said carrier. The carrier 7 is at this time back out of active position, and the arm 53 stands below the gripper of said carrier. When the yarns are to be changed, the cam-disks 29' and 30 are advanced a step, as above described. This movement of the cam-disks operates the carriers as follows: Carrier 6 is moved back into the position shown in Fig. 2, thus carrying the lever 17 into the path of one of the cams 50. The carrier 6 in its backward movement also engages the short arm of lever 52 and rocks said lever on its pivot and into the position shown in Fig. 2. When the lever 52 swings below the jaws 13 and 14, it carries the thread a into the notch formed by the ends of the jaws, and when the jaws are opened by the action of cam 50 on the lever 17 said thread passes between said jaws and rests against pin 20. At the same time that carrier 6 is moved back carrier 7 is swung down into the position shown in Fig. 2, with its thread eye and holder upon opposite sides of the needles, and the thread b between the thread eye and holder passes through the passage 2 into the guide 1 and between two adjacent needles. The carrier 7 immediately moves back into active position—that is to say, into a position corresponding to the position of carrier 6 in Fig. 1. As the carrier 7 moves away from the needles the thread b is knit into the fabric and the end of said thread pulls from between the jaws 13 and 14, the grip of the jaws being adjusted by the screw 23 to allow this without danger of breaking the thread. At or about the time the thread b is engaged by the needles the cam 50 releases the arm 17 of the carrier 6 and the jaws of its gripper are closed, severing the thread a, the end of which passes through the guide 1 to the needles. The thread b is now the knitting-thread and is guided to the needles until the cam-disks are again moved forward, when the carrier 6 carries the thread a to the needles and returns to active position, and the carrier 7 moves back and thread b is withdrawn from the needles. Thus the carriers are successively operated to carry the threads to the needles.

While it is preferred to use the form of carriers shown, consisting of a thread-engaging device and holder which are moved into position upon opposite sides of the needles and to form said thread-engaging device as a thread-eye which at times acts as a stationary guide for guiding the thread and when the

thread is to be changed coacts with the holder to carry the thread to the needles, it will be understood that other forms of carriers may be used. It will also be understood that the invention is not limited in application to machines in which the traveling cam-carrier is a cam-cylinder, but may be used in connection with other forms of traveling cam-carriers, and that certain features of invention are not limited to machines in which the cams are mounted on traveling carriers, but may be used in machines in which the cams are stationary and the needles travel.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a knitting-machine, the combination with a traveling carrier for the needle-operating cams, of a plurality of thread-carriers mounted independent of said cam-carrier, and means for operating said carriers successively to carry the threads to the needles, substantially as described.

2. In a knitting-machine, the combination with a rotary carrier for the needle-operating cams, of a plurality of thread-carriers mounted independent of said cam-carrier, and means for operating said carriers successively to carry the threads to the needles, substantially as described.

3. In a knitting-machine, the combination with a rotary carrier for the needle-operating cams, of means independent of the cam-carrier for guiding a plurality of threads, a plurality of thread-carriers, and means for operating said carriers successively to carry the threads to the needles, substantially as described.

4. In a knitting-machine, the combination with a rotary cam-carrier, of means independent of the cam-carrier for guiding a plurality of threads, a thread-guide moving with said carrier, a plurality of thread-carriers, and means for operating said carriers successively to carry said threads to said guide and to the needles, substantially as described.

5. In a knitting-machine, the combination with a rotary cam-carrier, means independent of said carrier for guiding a plurality of threads, a thread-guide moving with said carrier, a plurality of thread-carriers, and means for operating said carriers successively to carry said threads to said guides and to the needles, and means for severing the threads, substantially as described.

6. In a knitting-machine, the combination with a traveling cam-carrier, of means independent of said carrier for guiding a plurality of threads, a thread-guide moving with said carrier, a plurality of thread-carriers, and a series of cams for successively reciprocating said carriers to carry said threads to the needles, substantially as described.

7. In a knitting-machine, the combination with a traveling cam-carrier, of means independent of said carrier for guiding a plurality of threads, a thread-guide moving with said carrier, a plurality of pivoted thread-carriers,

and means for successively rocking said carriers on their pivots to carry said threads to said guide and to the needles, substantially as described.

5 8. In a knitting-machine, the combination with a traveling cam-carrier, of means independent of said carrier for guiding a plurality of threads, a thread-guide moving with said carrier, a plurality of pivoted carriers, and a
10 series of cams for successively rocking said carriers on their pivots to carry said threads to said guide and to the needles, substantially as described.

9. In a knitting-machine, the combination
15 of a plurality of thread-carriers, each comprising a thread-engaging device, and a thread-holder, and means for successively operating said carriers to carry threads to the needles, substantially as described.

20 10. In a knitting-machine, the combination of a plurality of thread-carriers each comprising a thread-guide and a thread-holder, and means for successively operating said carriers to carry threads to the needles, substantially
25 as described.

11. In a knitting-machine, the combination of a plurality of pivoted thread-carriers each comprising a thread-guide and a thread-holder, and a plurality of cams for success-
30 sively operating said carriers to carry threads to the needles, substantially as described.

12. In a knitting-machine, the combination of a plurality of thread-carriers each embodying a gripper, a disk, means for intermit-
35 tently operating said disk, means secured to said disk for reciprocating said carriers, and cams secured to said disk for operating the movable jaws of the grippers, substantially as described.

40 13. In a knitting-machine, the combination of a plurality of arms, a thread-engaging device and a thread-holder on each arm, and means for moving said arms successively to carry the engaging devices and holders upon
45 opposite sides of the needles, substantially as described.

14. In a knitting-machine, the combination of two thread-carriers each embodying a gripper, means for operating the carrier for the
50 non-knitting thread to carry said thread to the needles, and means for simultaneously carrying the knitting-thread between the jaws of its grippers, substantially as described.

15. In a knitting-machine, the combination
55 of two thread-carriers each embodying a gripper, means for operating the carrier for the non-knitting thread to carry said thread to the needles, means for simultaneously carrying the knitting-thread between the jaws of
60 its gripper, and means for severing the thread, substantially as described.

16. In a knitting-machine, the combination of two thread-carriers each embodying a thread-guide and a gripper, means for oper-
65 ating the thread-carrier for the non-knitting thread to carry said thread to the needles, and return said carrier to active position, means for simultaneously moving the carrier for the knitting-thread, out of active position,
70 and carrying the thread between the jaws of its gripper, substantially as described.

17. In a knitting-machine, the combination of an arm, a thread-engaging device rigidly secured thereto, a holder rigidly secured to
75 said arm, and means for moving said arm to carry said holder and thread-engaging device into position upon opposite sides of the needles, substantially as described.

18. In a knitting-machine, the combination of a pivoted arm, a thread-engaging device
80 rigidly secured to said arm, a thread-holder rigidly secured to said arm, and means for rocking said arm about its pivot to carry said holder and engaging device into position upon
85 opposite sides of the needles, substantially as described.

19. In a knitting-machine, the combination of an arm, a thread-guide rigidly secured thereto, a holder rigidly secured to said arm, and means for moving said arm to carry said
90 guide and holder into position upon opposite sides of the needles, substantially as described.

20. In a knitting-machine, the combination of a pivoted arm, a thread-engaging device
95 secured to said arm, a gripper secured to said arm, a cam for rocking said arm, and a cam for operating the movable jaw of the gripper, substantially as described.

21. In a knitting-machine, the combination
100 of a pivoted thread-carrier embodying a gripper, a disk, means for intermittently operating said disk, a cam secured to said disk for rocking said carrier, and a cam on said disk for operating the movable jaw of the gripper,
105 substantially as described.

22. In a knitting-machine, the combination, of a thread-carrier embodying a gripper, an adjustable stop for adjusting the force of the
110 grip upon the thread and means for moving the carrier to and from the needles substantially as described.

23. In a knitting-machine, the combination of a thread-carrier embodying a gripper, an adjustable stop for limiting the approach of
115 the jaws of the gripper to each other and means for moving the carrier to and from the needles, substantially as described.

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